

### **REMARKS/ARGUMENTS**

Claims 1-13 pending in this application. Claims 11 and 13 have been cancelled. Applicants preserve the right to pursue the subject matter of any cancelled claims in one or more continuing applications. In view of foregoing amendments and following remarks, the Applicants request allowance of the Application.

#### **Claim Rejection Under 35 U.S.C. §101**

Claims 1-13 are rejected under 35 U.S.C. § 101 because a claim may not preempt every substantial practical application of an abstract idea. The MPEP (2106 IV C 3) cites this concern for applications of a mathematical nature. Applicants have cancelled all independent claims containing mathematical formulas, thus rendering the rejection under 35 U.S.C § 101 moot.

#### **Claim Rejections Under 35 U.S.C. §103(a)**

Claims 1-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over "The Performance of Analytical Approximations for the Computation of Asian Quanto-Basket Option Prices" written by Datey, Gauthier, and Simonata in 2003 (hereinafter "Datey"), in view of "Asian Basket Spreads and other Exotic Averaging Options", written by Castellacci and Sidari in 2003 (hereinafter "Castellacci"). Applicants have amended independent claim 1 to include the following elements:

reading an evaluation date into a memory; reading contract data for one or more underlyings belonging to a basket into the memory;

reading market data for one or more underlyings belonging to the basket into the memory; reading an indication of whether the NPV is designated for a call or a put into the memory;

calculating a first moment of a sum of spot values  $S_j(t_i)$  of two or more underlyings of the basket;

calculating a second moment of the sum of spot values  $S_j(t_i)$  of two or more underlyings of the basket, wherein the first and second moments are approximate log normal distributions; and

It is well settled in the case law that in order for a claim to be rejected for obviousness under §103, the prior art must teach or suggest each element of the claimed invention. *See e.g. In re Bond*, 910 F.2d 831, 834 (Fed. Cir.1990). The present Office Action fails to point out where in

the cited art the elements listed above appear, and therefore, the present Office Action fails to put forth a *prima facie* case of obviousness. Additionally, the current Office Action asserts that Datey teaches calculating moments, but it does not teach calculating a moment of a sum of spot values for "two or more underlyings" as in claim 1.

For at least the reasons mentioned above, applicants assert that claims 1-10 and 12 are allowable, and accordingly, applicants respectfully request that the rejection of claims 1-10 and 12 under 35 U.S.C 103(a) be withdrawn.

### **Response to 37 C.F.R. § 1.105 Requirement**

Applicants acknowledge the duty of candor and good faith under 37 C.F.R. § 1.56.

Applicants hereby provide the following answers in response to the questions presented in the Requirement for Information (the answer numbers correspond to question numbers enumerated in the Office Action of Sept. 21, 2007):

3. Applicants note that the specification discusses moments of the sum of spot values of underlyings in paragraph [0042]. In particular, the specification states that the "approach described herein uses a generalization of Levy. While Levy's approach relates to one underlying, the approach herein is generalized to use more than one underlying. From the generalization it follows that all correlations, not only between pairs of underlyings, but also between pairs of underlyings at distinct future instants are taken into account. The method disclosed herein is realized through a modification to the boundary values of a Levy approximation, followed by an application of Black-Scholes formalism."

7. Pursuant to 37 C.F.R. § 1.105 and MPEP § 704.12(b), Applicants submit the information required to be submitted is unknown and/or is not readily available at this moment. Applicants acknowledge the duty of candor and good faith under 37 C.F.R. § 1.56 and will provide any relevant information as soon as it becomes available.

8. Pursuant to 37 C.F.R. § 1.105 and MPEP § 704.12(b), Applicants submit the information required to be submitted is unknown and/or is not readily available at this moment. Applicants acknowledge the duty of candor and good faith under 37 C.F.R. § 1.56 and will provide any relevant information as soon as it becomes available.

9. Applicants did not rely upon any publication in drafting the claimed subject matter.

10. Applicants submit the equations and descriptions of variables in the equations for calculating the net present value (NPV) of an average spot basket option (ASpBO) can be found in the specification at paragraph [0027]. Nevertheless, the same equations are reproduced hereinbelow as requested. As stated in paragraph [0027],  $V_{CALL}$ ,  $V_{PUT}$ , or  $V_{CALL/PUT}$  are each synonymous with NPV.

$$\left. \begin{aligned} V_{call}(t_H) &= e^{-r(t_H, T)(T-t_H)} \left[ + \tilde{F} N(\tilde{d}_1) - \tilde{K} N(\tilde{d}_2) \right] \\ V_{put}(t_H) &= e^{-r(t_H, T)(T-t_H)} \left[ - \tilde{F} N(-\tilde{d}_1) + \tilde{K} N(-\tilde{d}_2) \right] \end{aligned} \right\} \quad \text{for } t_H \leq T \text{ and } \tilde{K} > 0$$

$$\left. \begin{aligned} V_{call}(t_H) &= e^{-r(t_H, T)(T-t_H)} \left[ + \tilde{F} - \tilde{K} \right] \\ V_{put}(t_H) &= 0 \end{aligned} \right\} \quad \text{for } t_H \leq T \text{ and } \tilde{K} \leq 0$$

$$V_{call/put}(t_H) = 0, \quad \text{for } t_H > T$$

where

$$\tilde{d}_1 = \frac{\ln \frac{\tilde{F}}{\tilde{K}}}{\nu} + \frac{\nu}{2}, \quad \tilde{d}_2 = \tilde{d}_1 - \nu \quad \text{Eqn. 3}$$

$$\tilde{K} = K - \sum_{j=1}^{N_A} \frac{1}{N} \sum_{i=1}^m S_j(t_i), \quad \text{where } t_m \text{ is latest instant with an already fixed spot} \quad \text{Eqn. 4}$$

$$\begin{aligned} \tilde{F} &= \langle M \rangle \\ \nu^2 &= \ln \langle M^2 \rangle - 2 \ln \langle M \rangle \end{aligned} \quad \begin{array}{l} \text{Eqn. 5} \\ \text{Eqn. 6} \end{array}$$

$$\langle M \rangle = \frac{1}{N} \sum_{j=1}^{N_A} S_j(t_E) e^{g_j(t_{m+1}-t_E)} \Sigma_j, \quad \text{if } t_E < t_i \text{ then set } m=0 \quad \text{Eqn. 7}$$

$$\Sigma_j = \frac{1 - e^{g_j(N-m)h}}{1 - e^{g_j h}}, \quad \text{if } |g_j h| > \varepsilon \quad \text{Eqn. 8}$$

otherwise

$$\Sigma_j = \sum_{i=0}^{N-m-1} e^{g_j h i} \quad \text{Eqn. 9}$$

$$\langle M^2 \rangle = \frac{1}{N^2} \sum_{j=1}^{N_A} \sum_{k=1}^{N_A} S_j(t_E) S_k(t_E) e^{(g_j + g_k + \rho_{jk} \sigma_j \sigma_k)(t_{m+1}-t_E)} \Sigma_{jk}, \quad \text{Eqn. 10}$$

$$\Sigma_{jk} = \frac{1 - e^{(g_j + g_k + \rho_{jk}\sigma_j\sigma_k)(N-m)h}}{(1 - e^{g_j h})(1 - e^{(g_k + g_k + \rho_{jk}\sigma_j\sigma_k)h})} - \frac{e^{g_j(N-m)h} - e^{(g_j + g_k + \rho_{jk}\sigma_j\sigma_k)(N-m)h}}{(1 - e^{g_j h})(1 - e^{(g_k + \rho_{jk}\sigma_j\sigma_k)h})} + \frac{e^{g_k h} - e^{g_k(N-m)h}}{(1 - e^{g_k h})(1 - e^{(g_j + \rho_{jk}\sigma_j\sigma_k)h})} - \frac{e^{(g_j + g_k + \rho_{jk}\sigma_j\sigma_k)h} - e^{(g_j + g_k + \rho_{jk}\sigma_j\sigma_k)(N-m)h}}{(1 - e^{(g_j + \rho_{jk}\sigma_j\sigma_k)h})(1 - e^{(g_k + \rho_{jk}\sigma_j\sigma_k)h})}$$

Eqn. 11

, if  $\begin{cases} |g_j h| > \varepsilon \cap \\ |g_k h| > \varepsilon \cap \\ |(g_j + g_k + \rho_{jk}\sigma_j\sigma_k)h| > \varepsilon \cap \\ |(g_j + \rho_{jk}\sigma_j\sigma_k)h| > \varepsilon \cap \\ |(g_k + \rho_{jk}\sigma_j\sigma_k)h| > \varepsilon \end{cases}$

otherwise

$$\Sigma_{jk} = \sum_{l=0}^{N-m-1} \sum_{l=1}^{N-m-1} e^{g_j h l} e^{(g_k + \rho_{jk}\sigma_j\sigma_k)h l} + \sum_{l=1}^{N-m-1} \sum_{l=0}^{l-1} e^{(g_j + \rho_{jk}\sigma_j\sigma_k)h l} e^{g_k h l}$$

Eqn. 12

$$h = \frac{t_N - t_{m+1}}{N - m - 1}, \text{ if } N-m > 1, \text{ otherwise set } h = 1$$

Eqn. 13

$$g_j = r(t_E, T) - q_j(t_E, T), j = 1, \dots, N_A$$

Eqn. 14

where

$N(x)$	normal cumulative distribution
$r(t_1, t_2)$	riskless domestic currency interest rate for the time span $t_1 \dots t_2$
$q_j(t_1, t_2)$	dividend rate, or foreign currency interest rate for the time span $t_1 \dots t_2$
$S_j(t)$	spot price of the $j$ -th underlying asset, $j = 1, \dots, N_A$
$\sigma_j$	volatility of the $j$ -th underlying asset
$\rho_{jk}$	correlation coefficient between the assets $j$ and $k$ (the correlation is related to the logarithm of the asset prices)
$K$	strike price
$\varepsilon$	is a predetermined limit, for example, in one embodiment $\varepsilon$ may be taken as $10^{-6}$ , of course other values are permissible
$\langle M \rangle$	first moment of the sum of spot prices $S_j(t)$ of all underlyings of a basket
$\langle M^2 \rangle$	second moment of the sum of spot prices $S_j(t)$ of all underlyings of a basket
$\tilde{F}$	modified forward spot for all underlyings
$\tilde{K}$	modified strike price

11. Applicants submit at least one improvement of the claimed subject matter over the cited art is a quicker and more efficient calculation of a net present value of an average spot basket option compared to a statistical Monte Carlo approach, as described in the specification in paragraphs [0040] and [0041]. Further, as stated in the specification in paragraph [0041], Applicants submit a Levy approximation to calculate a net present value of an average spot

basket option is limited to an option with only one underlying. Sequentially applying Levy approximations and methods for determining the value of basket options is undesirable. Thus, as stated in the specification in paragraph [0042], the claimed subject matter improves on a Levy approximation by enabling calculation of a net present value of an average spot basket option with more than one underlying, such that "pairs of underlyings" and "pairs of underlyings at distinct future instants are taken into account". The four "reading..." limitations and the two "calculating..." limitations of representative claim 1 facilitate these improvements.

12. Applicants did not perform any searches of prior art in conjunction with the development of this invention.

All outstanding rejections have been overcome. It is respectfully submitted that, in view of the foregoing amendments and remarks, the application is in clear condition for allowance. Issuance of a Notice of Allowance is earnestly solicited.

Although not believed necessary, the Office is hereby authorized to charge any fees required under 37 C.F.R. § 1.16 or § 1.17 or credit any overpayments to Deposit Account No. 11-0600.

The Office is invited to contact the undersigned at (408) 975-7500 to discuss any matter regarding this application.

Respectfully submitted,

KENYON & KENYON LLP

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/Mark D. Yuan/

Mark D. Yuan  
(Registration No.: 57,312)

Kenyon & Kenyon LLP  
333 West San Carlos Street, Suite 600  
San Jose, CA 95110

Telephone: (408) 975-7500  
Facsimile: (408) 975-7501